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(71)Applicant : CANON INC

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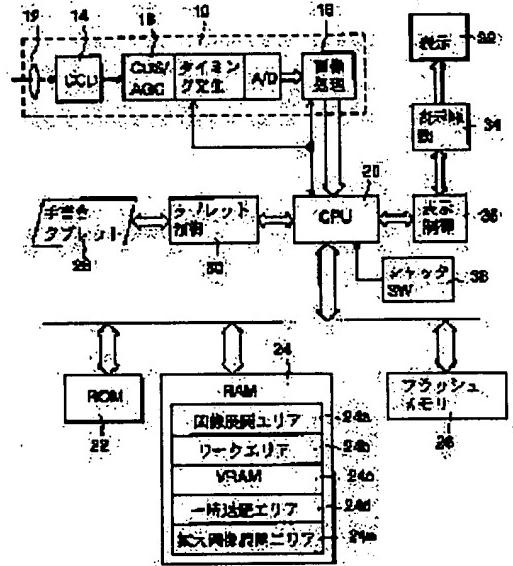
(72)Inventor : FUSHIMOTO HIDEO

(54) PICTURE PROCESSOR, PICTURE PROCESSING METHOD AND RECORDING MEDIUM

(57)Abstract:

PROBLEM TO BE SOLVED: To quickly and easily attain retrieval.

SOLUTION: The compressed picture data of a photographic picture and its thumbnail picture are stored in a flash memory 26. The thumbnail pictures are displayed as a list, and the desired picture is designated by a handwritten tablet 28. The picture corresponding to the designated thumbnail picture is read from the memory 26, and extended so that an intermediate picture in a size smaller than that of a full picture, and larger than that of the thumbnail picture can be obtained, and displayed on the screen of a liquid crystal panel 32. When the intermediate picture is selected, this picture is displayed as the full picture.



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CLAIMS

[Claim(s)]

[Claim 1] The image processing system characterized by providing the following. Image display means A storage means to memorize a picture A list display-control means to indicate the small picture with few pixels of the picture concerned memorized by the storage means concerned by list on the screen of the image display means concerned A specification means to specify a desired picture on the list display screen by the list display-control means concerned, The middle size image display control means which display the picture specified by the specification means concerned on the screen of the image display means concerned in one or more middle-sizes from the size of the small picture concerned to the size of a full picture, Full image display control means displayed on the image display means concerned by the full picture according to the predetermined operation to the picture of the middle-size concerned

[Claim 2] An image processing system according to claim 1 with the gradual middle size concerned.

[Claim 3] An image processing system according to claim 1 with the continuous middle size concerned.

[Claim 4] The middle size image display control means concerned are image processing systems according to claim 1 on which the picture which is not specified is also expanded and displayed when displaying the picture specified by the specification means concerned in the middle-size concerned.

[Claim 5] The image-processing method characterized by providing the following. The list display-control step which indicates the small picture with few pixels of the picture memorized by the storage means by list on the screen of an image display means The specification step which specifies a desired picture on the list display screen by the list display-control step concerned The middle size image display control step which displays the picture specified by the specification step concerned on the screen of the image display means concerned in one or more middle-sizes from the size of the small picture concerned to the size of a full picture The full image display control step displayed on the image display means concerned by the full picture according to the predetermined operation to the picture of the middle-size concerned

[Claim 6] The image-processing method according to claim 5 that the middle size concerned is gradual.

[Claim 7] The image-processing method according to claim 5 that the middle size concerned is continuous.

[Claim 8] The middle size image display control step concerned is the image-processing method according to claim 5 of also expanding and displaying the picture which is not specified when displaying the picture specified at the specification step concerned in the middle-size concerned.

[Claim 9] The storage characterized by memorizing the program software which is characterized by providing the following, and which performs the image-processing method The list display-control step which indicates the small picture with few pixels of the picture memorized by the storage means by list on the screen of an image display means The specification step which specifies a desired picture on the list display screen by the list display-control step concerned The middle size image display control step which displays the picture specified by the specification step concerned on the screen of the image display means concerned in one or more middle-sizes from the size of the small picture concerned to the size of a full picture The full image display control step displayed on the image display means concerned by the full picture according to the predetermined operation to the picture of the middle-size concerned

[Claim 10] A storage according to claim 9 with the gradual middle size concerned.

[Claim 11] A storage according to claim 9 with the continuous middle size concerned.

[Claim 12] The middle size image display control step concerned is a storage according to claim 9 on which the picture which is not specified is also expanded and displayed when displaying the picture specified at the specification step concerned in the middle-size concerned.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to an image processing system, a method, and a storage.

[0002]

[Description of the Prior Art] In recent years, highly-minute-izing of image pick-up elements, such as a CCD sensor and a COMS sensor, miniaturization, and power-saving are realized, and many small and cheap digital cameras are proposed. This kind of digital camera possesses the image display equipment which displays the picture memorized by the storage which memorizes a photography picture, a photography picture, or the storage concerned. A liquid crystal display panel is usually used for image display equipment. There are what has finder optical system independently as a finder which checks the composition for photography, and a thing which makes above-mentioned image display equipment serve a double purpose. A solid-state memory apparatus like a flash memory is used for a storage.

[0003]

[Problem(s) to be Solved by the Invention] The method of using for a display the so-called thumbnail picture which thinned out the pixel of a photography picture as a means to search two or more photography pictures memorized by the storage is learned. In this case, two or more pictures (for example, 3x3 pictures or 4x4 pictures etc.) can be simultaneously displayed on an image display screen. When the thumbnail picture is beforehand prepared apart from the photography picture, a thumbnail picture is only read from a storage, and is only displayed, and there is an advantage that the time which a display takes becomes short. The picture will be specified and a user will do full screen reproduction, if a desired picture is discovered out of the displayed thumbnail picture. Thereby, the specified picture is reproduced on a full screen.

[0004] Of course, it is common that the mode which always displays a storage picture on a full screen is also prepared. By specifying the picture which should be displayed one by one, a storage picture can be checked one by one. In this case, though natural, since the time taken to display one picture is very long compared with a thumbnail picture, it requires long time for the change of a screen, and does not turn to the reference purpose.

[0005] A thumbnail picture has few pixels remarkably to the number of pixels of a former picture. Therefore, when a similar picture continues, it is difficult to discriminate each picture only by the thumbnail picture. If full image display is performed by incorrect ***** specification, by the time it discovers a desired picture, it will take long time as a result.

[0006] this invention aims at showing the storage which memorizes the image processing system which canceled such un-arranging, a method, and the program software of the method.

[0007]

[Means for Solving the Problem] A storage means by which the image processing system concerning this invention remembers a picture to be an image display means, The small picture with few pixels of the picture concerned memorized by the storage means concerned on the list display screen by the list display-control means which indicates by list on the screen of the image display means concerned, and the list display-control means concerned A specification means to specify a desired picture, and the middle size image display control means which display the picture specified by the specification means concerned on the screen of the image display means concerned in one or more middle-sizes from the size of the small picture concerned to the size of a full picture, It is characterized by providing the full image display control means displayed on the image display means concerned by the full picture according to the predetermined operation to the picture of the middle-size concerned.

[0008] The image-processing method concerning this invention the small picture with few pixels of the picture memorized by the storage means on the list display screen by the list display-control step which indicates by list on the screen of an image display means, and the list display-control step concerned The picture specified by the specification

step which specifies a desired picture, and the specification step concerned. The middle size image display control step displayed on the screen of the image display means concerned in one or more middle-sizes from the size of the small picture concerned to the size of a full picture. It is characterized by providing the full image display control step displayed on the image display means concerned by the full picture according to the predetermined operation to the picture of the middle-size concerned.

[0009] The program software which performs the above-mentioned image-processing method is stored in the storage concerning this invention.

[0010]

[Example] Hereafter, with reference to a drawing, the example of this invention is explained in detail.

[0011] Drawing 1 shows the outline configuration block view of one example of this invention. 10 is a camera module, drives a taking lens 12, the image pck-up element 14, and the image pck-up element 14, and possesses the image-processing circuit 18 which carries out the image processing of the image data from noise rejection, gain control, the CCD control circuit 16 that carries out A/D conversion, and the CCD control circuit 16 for the output signal. The CCD control circuit 16 removes a noise from the output signal of the timing generating circuit which supplies a transfer clock signal and a shutter signal to the image pck-up element 14, and the image pck-up element 14, and possesses the A/D converter which changes into a 10-bit digital signal the analog output of CDS/AGC circuit which carries out the automatic regulation of the gain, and the CDS/AGC circuit 14.

[0012] The image pck-up element 14 changes the optical image by the taking lens 12 into an electrical signal. The timing generating circuit of the CCD control circuit 16 supplies a transfer clock signal and a shutter signal to the image pck-up element 14. CDS/AGC circuit of the CCD control circuit 16 remove a noise from the output signal of the image pck-up element 14, and adjusts gain. The A/D converter of the CCD control circuit 16 changes the analog output of CDS/AGC circuit into a 10-bit digital signal. The image-processing circuit 18 performs image processings, such as gamma conversion, a color space conversion, white balance adjustment, exposure control, and flash plate amendment, to the 10-bit image data outputted from A/D converter 16 of CCD control circuit 16 **, and outputs the 8-bit signal of YUV (4:2:2) form to it.

[0013] It is the flash memory CPU (arithmetic and program control) by which 20 controls the whole, ROM (read-only memory) which memorizes the control program with which 22 operates on CPU20, and 24 remember RAM (RAM), and 26 remembers a photography picture to be. The display drive circuit where the tablet control circuit which 28 controls a handwriting tablet, and 30 controls the handwriting tablet 28, and supplies the input data to CPU20, and 32 drive a liquid crystal display panel, and 34 drives the liquid crystal display panel 32, the display-control circuit where 36 controls the display drive circuit 34, and 38 are shutter switches.

[0014] CPU20 controls each part according to the control program stored in ROM22. They are the processing which reads the output image data of the image-processing circuit 18, specifically carries out JPEG compression of the processing which carries out a DMA transfer to RAM24, the processing which carries out the DMA transfer of the indicative data from RAM24 to the display-control circuit 36, and the image data, and is stored in a flash memory 26 by predetermined file format, the executive operation of the various applications according to the information inputted from the handwriting tablet 28, directions processing of photography operation accompanying operation of the shutter switch 38, etc.

[0015] RAM24 possesses evacuation area 24d and expansion picture expansion area 24e picture expansion area 24a, work area 24b, VRAM24c, and temporarily. Picture expansion area 24a is used as a work area only for pictures for picture compression extension processing as a temporary buffer for storing ***** photography image data (digital YUV signal) and the JPEG compression image data read from the flash memory 26 from the image-processing circuit 18 temporarily. Work area 24b is a work area for various programs. VRAM24c is used as area which stores the indicative data displayed with display 32. Evacuation area 24d is the area for evacuating various data temporarily.

[0016] The photography image data in which JPEG compression was carried out by CPU20, the various attached data referred to from application are stored in the flash memory 26 by predetermined file format.

[0017] The tablet control circuit 30 drives the handwriting tablet 28, changes into a digital signal the various information inputted into the handwriting tablet 28 by the pen touch, and transmits it to CPU20.

[0018] CPU20 supplies the YUV image data outputted from the image-processing circuit 18, or the YUV image data by which was read from the flash memory 26 and JPEG extension was carried out to the display-control circuit 36. The display-control circuit 36 changes these YUV image data into RGB form, and supplies it to the display drive circuit 34. The display drive circuit 34 drives each pixel of a liquid crystal display panel according to the RGB image data from the display-control circuit 36. The liquid crystal display panel 32 consists for example, of a VGA specification (640x480 dots) TFT liquid crystal display.

[0019] The shutter switch 38 is for directing a photography start, and according to the depression of this shutter switch 38, CPU20 starts the camera module 10 and incorporates the output image data of the image-processing circuit 18.

[0020] Drawing 2 shows the appearance perspective diagram of this example. In the front face of the main part 40 of a camera, the handwriting tablet 28 is arranged in piles at the liquid crystal display panel 32. The handwriting tablet 28 serves as a transparent touch panel which penetrates the display image of a display panel 32. 42 is the touch pen of the handwriting tablet 28. 44 is an electric power switch which turns on / turns off the power supply of a main part 40. The cylinder material 46 is formed in the unilateral side of a main part 40 free [rotation] to the main part 40. In the aperture 48 of cylinder material, the taking lens 12 and the image pck-up element 14 are arranged. Other elements illustrated to drawing 1 are held in the interior of a main part 40.

[0021] A user turns the aperture 48 of the cylinder material 46 to a photographic subject, and if the liquid crystal display panel 32 checks and determines a photographic subject's composition, he will do the depression of the shutter switch 38. Thereby, a photograph can be taken in the composition of a request of a desired photographic subject, and a photography picture is stored in a flash memory 26.

[0022] Drawing 3 shows the example of a screen of the reference operation in this example. In this example, each photography picture is managed as a file and each file is held in two steps of folders, or a directory. for example, the bottom of a "travel folder" -- "a snap folder" -- relation -- the price -- ** -- the snapshot of a travel is stored under the "snap folder" The thumbnail picture of 80x60 dots is formed from each picture under a folder, and it holds in the same folder. Two or more thumbnail pictures can be displayed on screen right-hand side. In drawing 3 , although 4x7 thumbnail pictures can be displayed simultaneously, since a scrolling icon can be scrolled up and down by touching with a pen 42, 29 or more pictures can also be displayed substantially.

[0023] When a desired thumbnail picture is found, by touching the thumbnail picture with a pen 42, the subject-copy image data of the thumbnail picture are elongated, and as shown in drawing 4 , it is displayed as a VGA picture of 640x480 dots.

[0024] As for the camera icon as which 50 means new photography, and 52, in drawing 3 and drawing 4 , a screen stepper button and 54 are the selection buttons of the thumbnail display screen.

[0025] If the camera icon 50 is touched with a pen 42 to take a photograph newly, the screen of new photography will be displayed. Drawing 5 shows the example of a screen of new photography. A finder screen is set up by 320x240 dots (QVGA), and the picture which carries out incidence to the image pck-up element 14 is displayed into it. A user moves the main part 40 of a camera, determines composition, looking at this finder display, and touches O.K. icon on the shutter switch 38 or a screen with a pen 42. y persons and a new picture are incorporated by this and it is stored in a flash memory 26 after predetermined processing Consequently, as shown in drawing 6 , the thumbnail picture corresponding to a new photography picture is displayed on the tail end of a thumbnail viewport.

[0026] With reference to the flow chart shown in drawing 7 and drawing 8 , the procedure of the above operation is explained in detail. Drawing 7 shows the flow chart of thumbnail selection processing. First, the thumbnail display screen as shown in drawing 3 is chosen and performed. A key stroke (pen operation) state is read (S1). When a thumbnail picture is chosen (S2), a corresponding compression picture data file is read from a flash memory 26 (S5), and it writes in picture expansion area 24a of RAM24, and JPEG compressed data is elongated to former data (YUV data) (S6), and the restored image data is written in VRAM24c (S7). The display-control circuit 36 reads YUV data of VRAM24d, and changes them into RGB form (S8), and the display drive circuit 34 drives the liquid crystal display panel 32 according to the RGB data from the display-control circuit 36 (S10). Thereby, the appointed picture is expressed as a full picture (640x420 dots).

[0027] When the camera icon which checks the existence of the shift to camera photography mode when a thumbnail picture is not chosen (S2) (S3) is chosen, it shifts to camera photography mode and shifts to the flow shown in drawing 8 . When not shifting to camera photography mode (S3), directions of other processings are checked and the appointed processing is performed (S4). When other processings are not chosen, either, it returns to (S4) and S1.

[0028] Drawing 8 shows the flow chart of a camera photography operation mode of operation. If it goes into camera photography mode, the camera module 10 and an image display system will be first made into operating state (S11). In order to gather processing speed, not the total pixel of 640x480 dots but the non-interlaced picture signal reduced to 320x240 dots by infanticide processing is made to output from the image pck-up element 14, if the shutter switch 38 is not operated (S12) (S13). The CCD control circuit 16 removes a noise from the output signal of the image pck-up element 14, adjusts gain, changes it into a digital signal, and is supplied to the image-processing circuit 18 (S14). The image-processing circuit 18 processes white balance adjustment, exposure adjustment, amendment at the time of speed light photography, etc. from the CCD control circuit 16 to image data, and changes them into YUV (4:2:2) form (S15).

[0029] CPU20 writes the image data by which YUV conversion was carried out from the image-processing circuit 18 in VRAM24c of RAM24. The data of VRAM24c are regularly supplied to the display-control circuit 36 by DMA. The

display-control circuit 36 changes the YUV image data from VRAM24c into RGB form, and supplies it to the display drive circuit 34 (S16). The display drive circuit 34 drives each pixel of the liquid crystal display panel 32 according to the RGB data from the display-control circuit 36 (S17). Thereby, a photographic subject's QVGA picture is displayed on the screen of the liquid crystal display panel 32 (S18).

[0030] As mentioned above, a photographic subject picture is always displayed on the screen of a display panel 32 by carrying out the loop of the processing from Step S13 to S18 continuously in the cycle of 1/30 second.

[0031] When the shutter switch 38 is pushed, it operates as follows. That is, in order to reduce the processing load of CPU20, a display system (the display drive circuit 34 and updating operation of a display panel 32) is stopped (S19). The picture signal of the number of pixels operated on a curtailed schedule in order to gather processing speed was made to output from the image pick-up element 14 in viewfinder processing. However, as a photography picture, the full picture of VGA specification (640x480 dots) is required. Therefore, after making the picture signal of the number of VGA pixels output from the image pick-up element 14 and performing predetermined processing in the image-processing circuit 18, the YUV data is written in picture expansion area 24a of RAM24 (S20). The image data of picture expansion area 24a is compressed based on a JPEG method (S21), and it writes in a flash memory 26 as an image file (S22). The thumbnail picture (80x60dot) data as data for a display are generated from the photoed image data (S23), and it stores in a flash memory 26 as data for a list display (S24). The generated thumbnail picture is compounded at the bottom of other thumbnail picture groups, and the drive of a display system is resumed (S26). Thereby, as shown in drawing 6, a list indication of the thumbnail picture of a photography picture is given in the form where the new picture was added (S27), and it returns to S1.

[0032] When many pictures are stored in the same folder, by utilizing thumbnail image display, the picture of two or more sheets can be simultaneously displayed on the display screen, and a desired picture can be searched with using screen rolling together at an early stage. However, when the similar picture is located in a line in the same folder, only by the thumbnail picture, it is difficult, and discernment needs to display one full picture (VGA) at a time, and needs to check. If the wrong picture is chosen when searching a desired picture out of a similar picture since the full picture output of a picture takes long time, retrieval effectiveness will fall remarkably. To specification of a thumbnail picture, this example displayed the picture of the middle number of pixels rather than displays a full picture immediately, in order to solve this. That is, as shown in drawing 9, when a user specified or chooses the 6th thumbnail picture, as shown in drawing 10, a specification picture is expressed as the picture (in the case of this example 160x120 dots) of the middle-resolution set up beforehand. At this time, the thumbnail picture which is not chosen does not need to perform excessive display processing as it is.

[0033] By checking the content of a picture by the middle picture displayed as shown in drawing 10, and touching the middle picture with a pen 42, if this picture is sufficient, as shown in drawing 11, it is expressed as a full picture. By touching another thumbnail picture with a pen 42, where a middle picture is displayed, a previous middle picture disappears and the middle picture corresponding to the newly chosen thumbnail picture is displayed.

[0034] A user may enable it to set up the number of pixels of a middle picture beforehand: moreover -- until it becomes the number of pixels of a full picture about a middle picture -- several step story -- it sets up and you may make it the number of pixels increase gradually at every pen touch

[0035] Drawing 12 and drawing 13 show the flow chart of the processing which displays a middle picture. First, the thumbnail display screen as shown in drawing 9 is chosen and performed. A key stroke (pen operation) state is read (S31). When a thumbnail picture is chosen (S32), a corresponding compression picture data file is read from a flash memory 26 (S33), and it writes in picture expansion area 24a of RAM24, and JPEG compressed data is elongated to former data (YUV data) (S34), and the restored image data is written in VRAM24c (S35). YUV data are changed into RGB form (S36), and are thinned out by the middle picture of 160x120 dots from the full picture of 640x480 dots (S37). It compounds with a non-chosen thumbnail picture (S38). At this time, as illustrated to drawing 10, a middle picture can be compounded by compounding a middle picture in the area for 4 blocks of a thumbnail picture, without changing the layout of a coalesce screen. Synthetic image data is impressed to the display drive circuit 34 (S39). It is displayed as the middle picture corresponding to the selected thumbnail picture shows by this drawing 10 (S40).

[0036] When the middle picture by which the enlarged display was carried out is not chosen again (S41), it returns to S1. If a middle picture is chosen again (S41), the image data elongated previously is read from picture expansion area 24a (S42), and the display-control circuit 36 will transform YUV form into RGB form (S43), and will supply the display drive circuit 34 (S44). According to the image data from the display-control circuit 36, the display drive circuit 34 displays the selected picture on the screen of the liquid crystal display panel 32 by the full picture (640x420 dots), as shown in drawing 11 (S45). Then, it becomes the waiting for a key input and returns to S1.

[0037] When a thumbnail picture is not chosen (S32), the existence of the shift to camera photography mode is checked (S46). When the camera icon is chosen, it shifts to camera photography mode (S47). Operation in camera photography

mode here is the same as having been shown in drawing 8. When not shifting to camera photography mode (S46), directions of other processings are checked (S48) and the appointed processing is performed (S49). When other processings are not chosen, either, it returns to (S48) and S1.

[0038] The example of change of the display screen is explained. Drawing 14 shows the basic example of the thumbnail display screen. If a user makes it move to size to expand where the corner of the thumbnail picture is pushed with the touch pen 42 when he finds a desired thumbnail picture, as shown in drawing 15, the dip of a line including the thumbnail picture and the breadth of a column including the thumbnail picture will be expanded simultaneously.

Therefore, as for the thumbnail picture belonging to the same line as the selected thumbnail picture, breadth is similarly expanded for the thumbnail picture to which the dip is expanded and belongs to the same column as the thumbnail picture similarly. However, since this picture expansion processing is limited in the viewport of a thumbnail picture group, there is no need of changing a layout, about the whole screen. If it continues moving the touch pen 42 further, pushing the corner of the selected thumbnail picture, the picture is expanded as shown in drawing 16. After checking the contents of a picture by the expansion operation with the touch pen 42, as shown in drawing 17, as shown in drawing 18, the full picture of VGA is displayed by choosing the expanded picture with the touch pen 42 again.

[0039] Although it interlocks and a non-choosing picture group is also expanded with expansion of a specification picture with this composition, a non-choosing picture group may maintain a thumbnail picture state the same with having explained previously.

[0040]

[Effect of the Invention] Retrieval time can be shortened while high reference of precision is attained since the contents of a picture can be checked in 1 or two or more middle picture sizes when searching [from] a desired picture according to this invention while displaying two or more pictures on the same display screen, so that he can understand easily from the above explanation.

[0041] It is in the display rectangle of two or more picture groups, and since picture size is changed, it is not necessary to change the layout of the whole display screen. It enables this to offer the GUI environment always intelligible for a user.

[0042] Since selection and expansion operation of a picture can be directly directed by the tablet on a display means, while operation becomes easy, it is easy to check change in the optimal picture size.

[Translation done.]

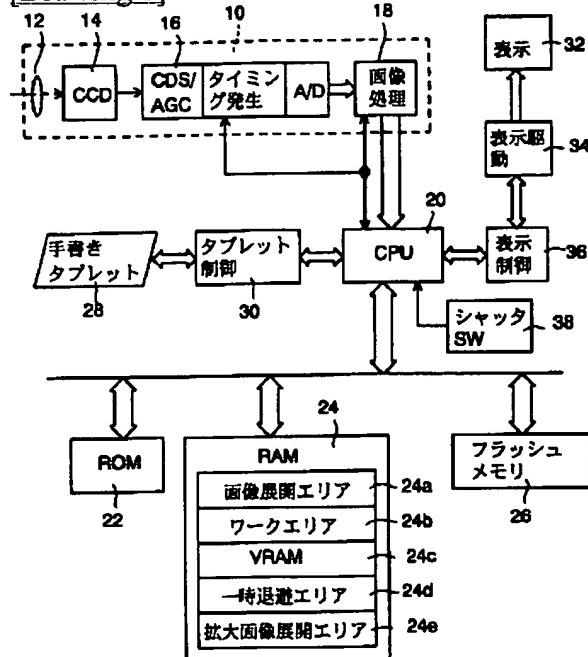
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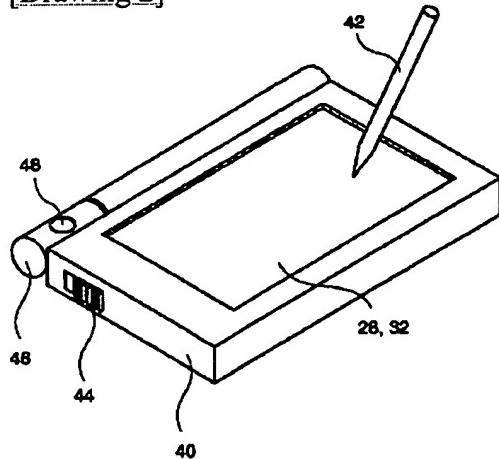
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DRAWINGS

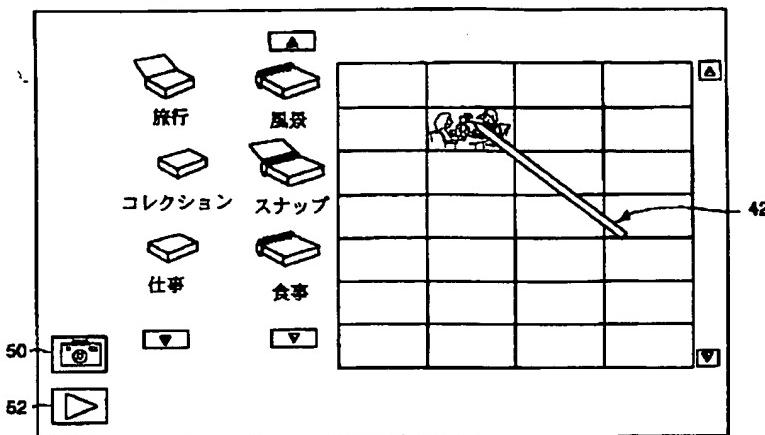
[Drawing 1]



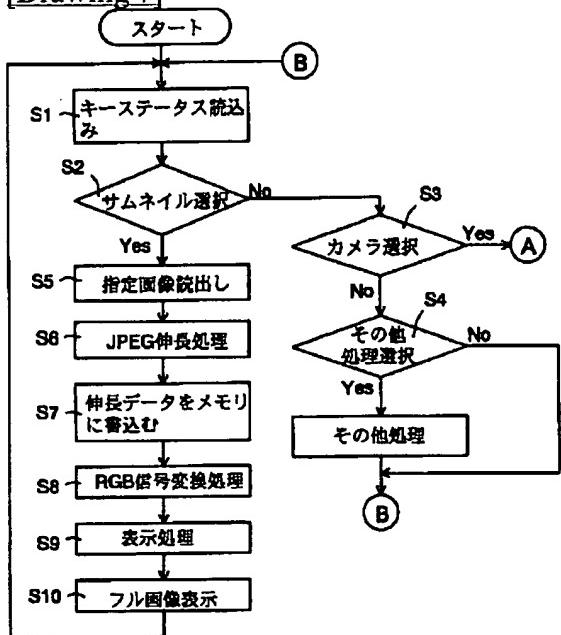
[Drawing 2]



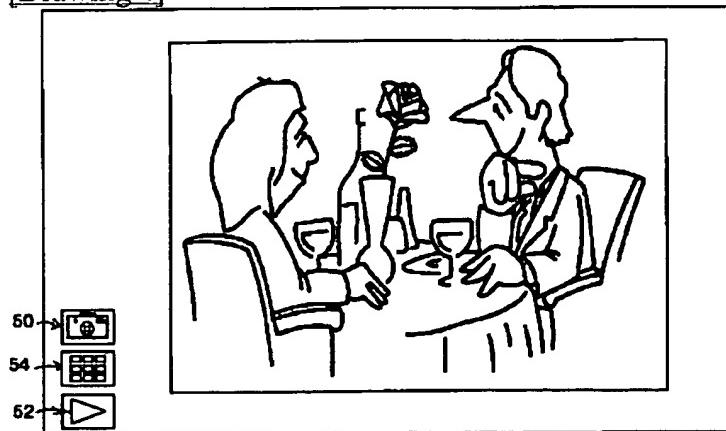
[Drawing 3]



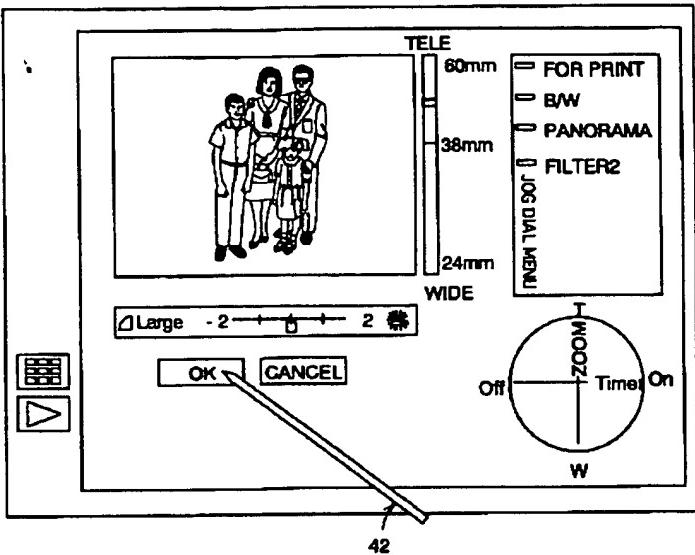
[Drawing 7]



[Drawing 4]

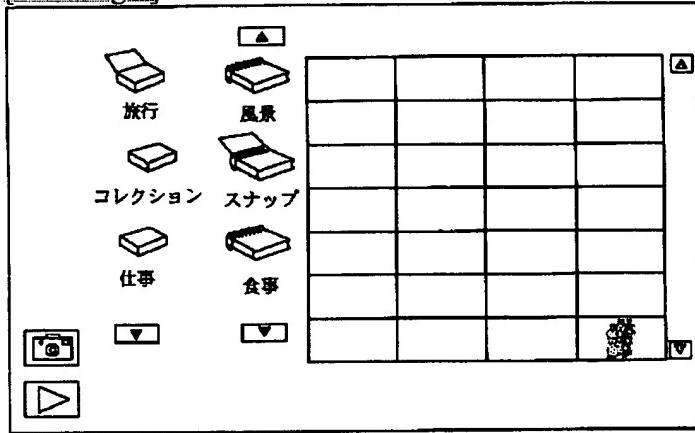


[Drawing 5]

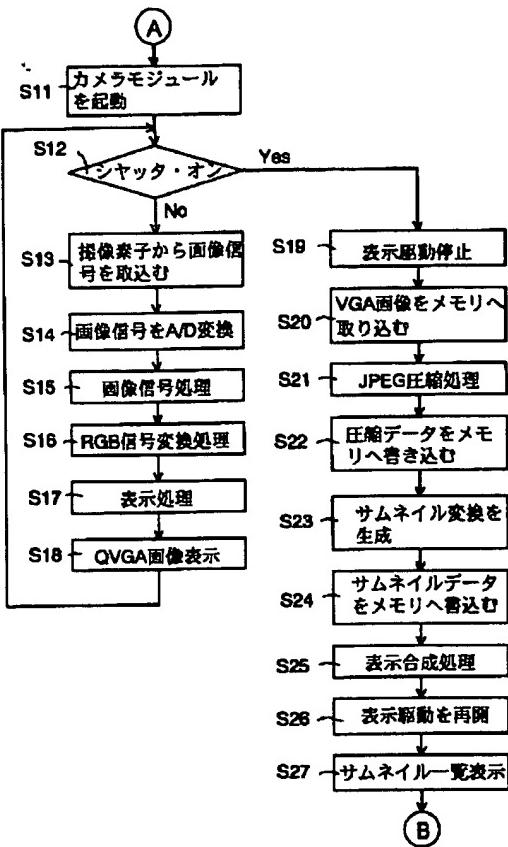


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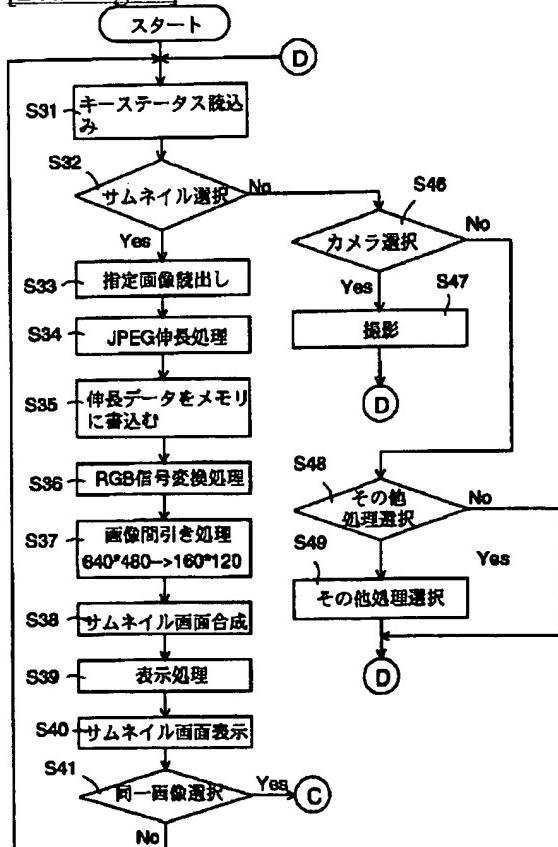
[Drawing 6]



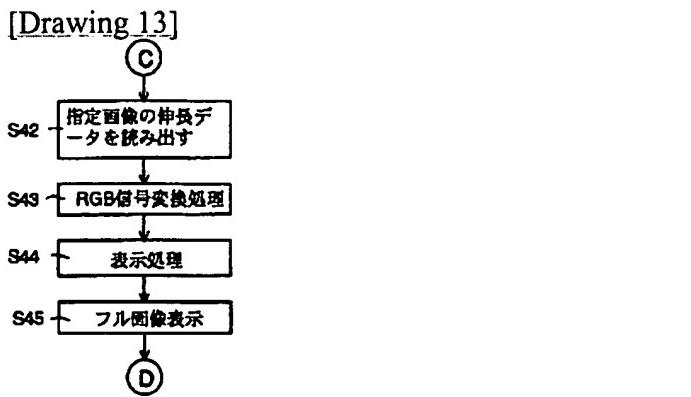
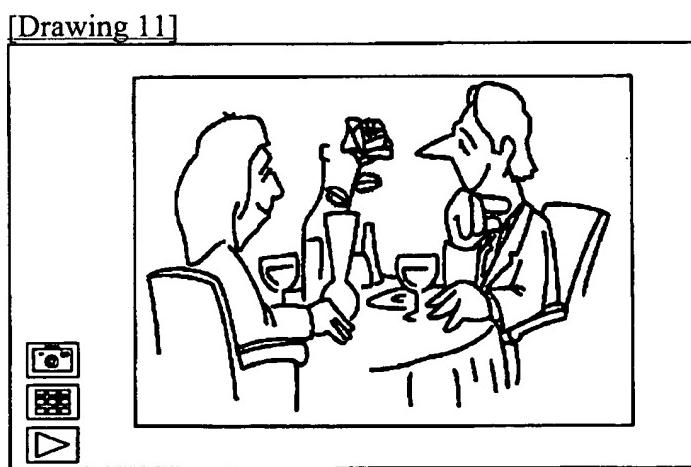
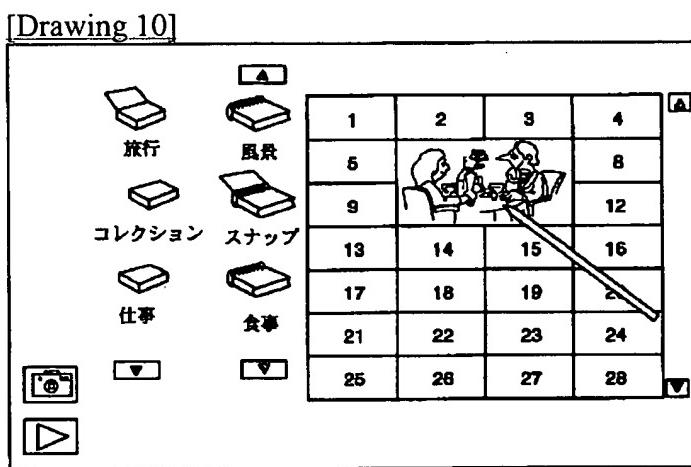
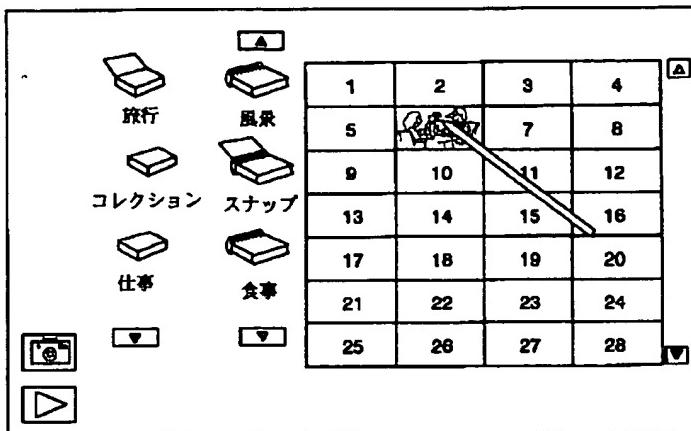
[Drawing 8]



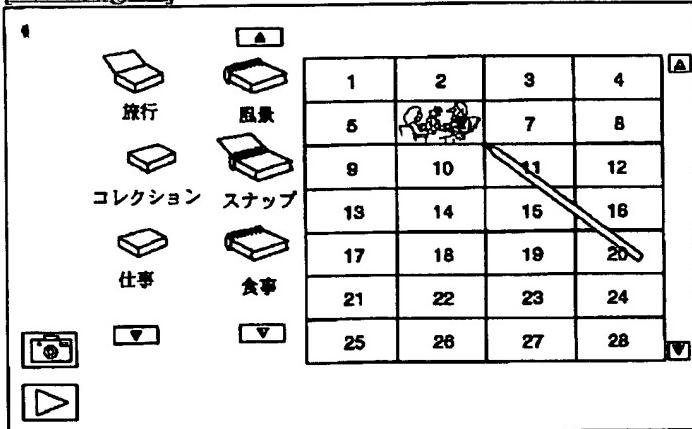
[Drawing 12]



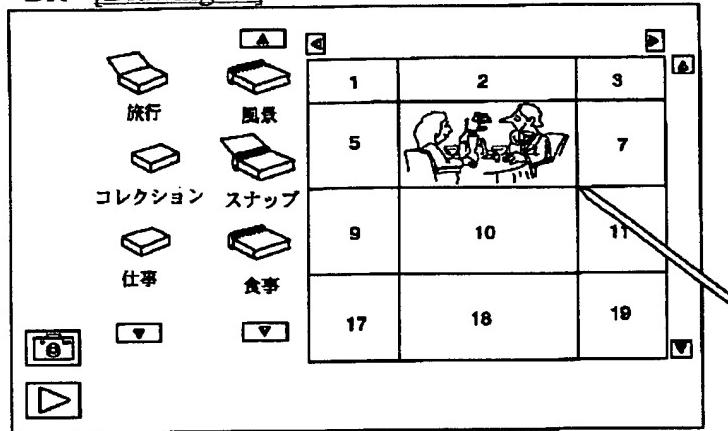
[Drawing 9]



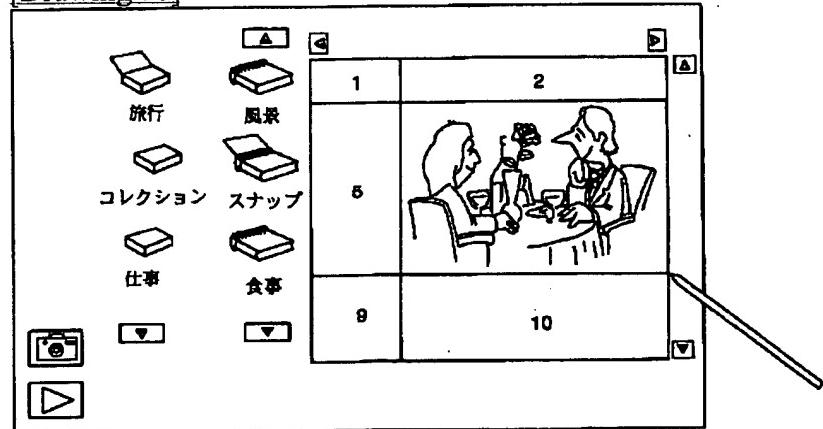
[Drawing 14]



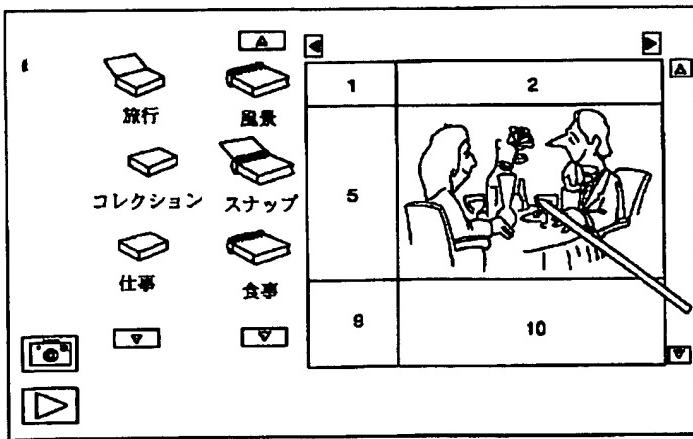
 [Drawing 15]



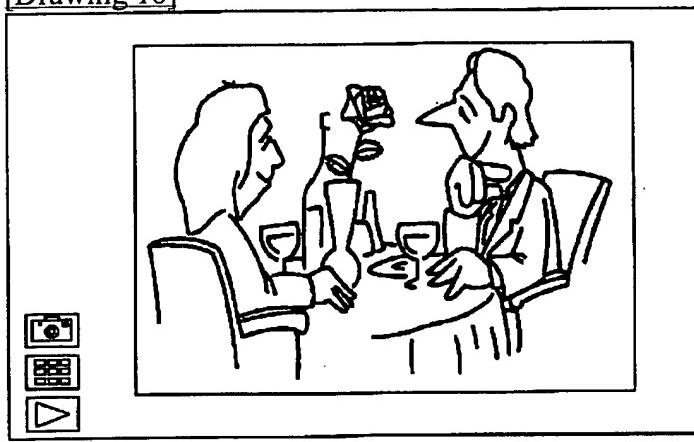
[Drawing 16]



[Drawing 17]



[Drawing 18]



[Translation done.]